

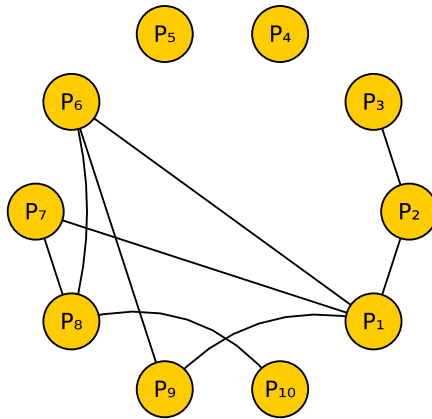
AI Planning

Exercise Sheet 9

Date: January 9, 2015
 Students: Axel Perschmann, Tarek Saier

Exercise 9.1

(a) Compatibility graph:



Maximal cliques: $\{P_1, P_2\}$, $\{P_1, P_6, P_9\}$, $\{P_1, P_7\}$, $\{P_2, P_3\}$, $\{P_4\}$, $\{P_5\}$, $\{P_6, P_8\}$, $\{P_7, P_8\}$, $\{P_8, P_{10}\}$.

(b)

$$\begin{aligned}
 h^{\mathcal{C}} &= \max\{h^{P_1} + h^{P_2}, h^{P_1} + h^{P_6} + h^{P_9}, h^{P_1} + h^{P_7}, h^{P_2} + h^{P_3}, h^{P_4}, h^{P_5}, h^{P_6} + h^{P_8}, h^{P_7} \\
 &\quad + h^{P_8}, h^{P_8} + h^{P_{10}}\} \\
 &= \max\{h^{\{at-goal_{s2}\}} + h^{\{at-goal_{s1}, position_{s1}\}}, h^{\{at-goal_{s2}\}} + h^{\{at-goal_{s1}, content_H\}} + \\
 &\quad h^{\{content_A, content_E\}}, h^{\{at-goal_{s2}\}} + h^{\{at-goal_{s1}, content_G\}}, h^{\{at-goal_{s1}, position_{s1}\}} + \\
 &\quad h^{\{at-goal_{s2}, position_{s2}\}}, h^{\{at-goal_{s1}, position_{s1}, position_p\}}, h^{\{position_{s1}, position_p\}}, \\
 &\quad h^{\{at-goal_{s1}, content_H\}} + h^{\{at-goal_{s2}, content_D\}}, h^{\{at-goal_{s1}, content_G\}} + h^{\{at-goal_{s2}, content_D\}}, \\
 &\quad h^{\{at-goal_{s2}, content_D\}} + h^{\{at-goal_{s1}, content_Q\}}\}
 \end{aligned}$$

Algebraic implication:

$$\begin{aligned}
 h^{\mathcal{C}} &= \max\{h^{\{at-goal_{s2}\}} + \max\{h^{\{at-goal_{s1}, position_{s1}\}}, h^{\{at-goal_{s1}, content_H\}} + h^{\{content_A, content_E\}}, \\
 &\quad h^{\{at-goal_{s1}, content_G\}}\}, h^{\{at-goal_{s1}, position_{s1}\}} + h^{\{at-goal_{s2}, position_{s2}\}}, h^{\{at-goal_{s1}, position_{s1}, position_p\}}, \\
 &\quad h^{\{position_{s1}, position_p\}}, h^{\{at-goal_{s2}, content_D\}} + \max\{h^{\{at-goal_{s1}, content_H\}}, h^{\{at-goal_{s1}, content_G\}}, \\
 &\quad h^{\{at-goal_{s1}, content_Q\}}\}\}
 \end{aligned}$$

Dominance pruning:

$$\begin{aligned}
 h^{\mathcal{C}} &= \max\{h^{\{at-goal_{s2}\}} + \max\{h^{\{at-goal_{s1}, position_{s1}\}}, h^{\{at-goal_{s1}, content_H\}} + h^{\{content_A, content_E\}}, \\
 &\quad h^{\{at-goal_{s1}, content_G\}}\}, h^{\{at-goal_{s1}, position_{s1}\}} + h^{\{at-goal_{s2}, position_{s2}\}}, h^{\{at-goal_{s1}, position_{s1}, position_p\}}, \\
 &\quad h^{\{at-goal_{s2}, content_D\}} + \max\{h^{\{at-goal_{s1}, content_H\}}, h^{\{at-goal_{s1}, content_G\}}, h^{\{at-goal_{s1}, content_Q\}}\}\}
 \end{aligned}$$

(c) Obviously not reasonable is:

Pattern	Reason
P_9	random positions, no relevance for goal

Most likely not reasonable are:

Pattern	Reason
$P_{6-8,10}$	one goal relevant variable + random position
P_1	by itself reasonable, but included in P_3
P_5	by itself reasonable, but included in P_4

$$h^{\mathcal{C}} = \max\{h^{P_2} + h^{P_3}, h^{P_4}\}$$